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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/576,767	05/24/2000	Yung-Soo Kim	030681-200	4658
21839	7590	12/29/2004	EXAMINER	
BURNS DOANE SWECKER & MATHIS L L P			RYMAN, DANIEL J	
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ALEXANDRIA, VA 22313-1404			PAPER NUMBER	
			2665	

DATE MAILED: 12/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/576,767

Applicant(s)

KIM ET AL.

Examiner

Daniel J. Ryman

Art Unit

2665

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 September 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15-29 is/are allowed.
- 6) ☒ Claim(s) 1, 4, 8 and 11 is/are rejected.
- 7) ☒ Claim(s) 2, 3, 5-7, 9, 10, and 12-14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 September 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see Response, filed 9/15/04, with respect to the rejection(s) of claim(s) 1, 4, 8, and 11 under either 35 USC § 102(a) or 35 USC § 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Harikumar et al. (USPN 6,631,175).
2. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.
3. Applicant's arguments, see Response, filed 9/15/04, with respect to claims 15 and 21 have been fully considered and are persuasive. The rejection of claims 15, 16, and 21 has been withdrawn.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
5. Claims 1, 4, 8, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harikumar et al. (USPN 6,631,175) in view of Baum et al. (USPN 5,867,478).
6. Regarding claims 1 and 8, Harikumar discloses a method and apparatus for transmitting orthogonal frequency division multiplexing (OFDM) signals, the method comprising the steps of and the apparatus comprising means for: coding the OFDM signals (Fig. 1, ref. 20; col. 1, lines

Art Unit: 2665

13-15; and col. 4, lines 39-40); forming a block of N coded data (blocks of data) (col. 4, lines 40-41) and dividing the block into L M-sized small blocks (subchannel blocks), where N, M and L indicate integers of 1 or more, and $L = N/M$ (col. 4, lines 41-47); M-point inverse discrete Fourier transforming the L small blocks (sub-symbols) (Fig. 1, ref. 30 and col. 4, lines 48-51); combining L M-point inverse discrete Fourier transformed blocks, and generating an N-sized inversely-transformed block (symbol) (col. 4, lines 50-53); attaching a cyclic prefix to the N-sized inversely-transformed block (Fig. 1, ref. 50 and col. 4, lines 54-57); and transforming the blocks having the attached cyclic prefix, into an analog signal (Fig. 1, ref. 60 and col. 4, lines 58-62) and transmitting the transformed analog signal (col. 4, lines 58-62).

Harikumar does not expressly disclose that the inverse discrete Fourier transform is an inverse fast Fourier transform. Baum teaches that IFFT is commonly used to efficiently generate a modulated OFDM signal (col. 3, lines 46-53). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to use inverse fast Fourier transform rather than an inverse discrete Fourier transform since IFFT efficiently generates modulated OFDM signals.

7. Regarding claims 4 and 11, Harikumar discloses a method and apparatus for receiving orthogonal frequency division multiplexing (OFDM) signals, the method comprising the steps of and the apparatus comprising means for: removing a cyclic prefix (Fig. 1, ref. 100 and col. 4, line 67-col. 5, line 4); dividing the signal sample block into L M-sized small blocks, where N, M and L are integers of 1 or more, and $L = N/M$ (Fig. 1, ref. 110 and col. 4, line 67-col. 5, line 4); M-point discrete Fourier transforming the L small blocks (Fig. 1, ref. 120 and col. 5, lines 4-6); combining the L M-point fast Fourier transformed small blocks, and generating an N-sized

Art Unit: 2665

transform block (Fig. 1, ref. 140; col. 4, lines 40-47; and col. 5, lines 5-6, where the decoder presumably performs the reverse process of the encoder such that the sub-blocks would be combined into blocks); and detecting data from the N-sized transform block, and decoding the detected data (Fig. 1, ref. 140 and col. 5, lines 5-6, where the decoder is mislabeled as ref. 130 in the specification).

Harikumar does not expressly disclose that the discrete Fourier transform is a fast Fourier transform. Baum teaches that IFFT is commonly used to efficiently generate a modulated OFDM signal (col. 3, lines 46-53) where it is implicit that FFT is commonly used to efficiently generate a demodulated OFDM signal. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to use fast Fourier transform rather than a discrete Fourier transform since FFT efficiently generates demodulated OFDM signals.

Allowable Subject Matter

8. Claims 2 and 9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The method disclosed for dividing and combining blocks is not expressly disclosed in the prior art.

9. Claims 3 and 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The method disclosed for dividing and combining blocks is not expressly disclosed in the prior art.

10. Claims 5 and 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim

Art Unit: 2665

and any intervening claims. The method disclosed for dividing and combining blocks is not expressly disclosed in the prior art.

11. Claims 6 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The method disclosed for dividing and combining blocks is not expressly disclosed in the prior art.

12. Claims 7 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art does not fairly suggest fast Fourier transforming the signal, equalizing the signal, and inverse fast Fourier transforming the signal (equalizing the signal in the frequency domain) before dividing the signal into blocks, and then fast Fourier transforming the blocks (processing the signal).

13. Claims 15, 16, and 21-23 are allowed. The prior art did not fairly suggest, in a transmitter, inserting a zero at the first data position of each block and adding pilot tones at positions other than a predetermined position among the positions at which the zero has been inserted.

14. Claims 17-20 and 24-29 are allowed. The prior art did not fairly suggest, in a receiver, inserting a virtual pilot tone at predetermined positions of a received frequency domain signal; extracting the virtual pilot tone in addition to pilot tones added upon transmission; and using the virtual pilot tone and the pilot tones added upon transmission to estimate channel characteristics.

Art Unit: 2665

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel J. Ryman whose telephone number is (571)272-3152. The examiner can normally be reached on Mon.-Fri. 7:00-4:30 with every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu can be reached on (571)272-3155. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Daniel J. Ryman
Examiner
Art Unit 2665




HUY D. VU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600